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ABSTRACT

The study compared the cognitively oriented teacher pupil interactions observed in a sample of 10 intermediate special classes for educable mentally retarded children with those observed in 10 regular third grade classes in the same schools. Examined were differences between samples in the rate of interaction, cognitive level, and distribution of opportunities among individual pupils, as well as the relationship of the teacher's cognitive demands on individuals to the teacher's evaluative judgment of those pupils. The observation instrument was the Individual Cognitive Demand Schedule by which observers code each instructional interchange between the teacher and an individual pupil. Data showed no significant differences between the special classes and the third grade classes on any cognitive demand indexes. Differences were found in the tendency to differentiate between pupils by level of achievement with the third grade teachers showing a marked tendency to favor those pupils whom they judged to be their better pupils. (GW)

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Center for Innovation in Teaching the Handicapped

School of Education, Indiana University, Bloomington

A COMPARISON OF TEACHERS' COGNITIVE DEMANDS IN SPECIAL EMR AND REGULAR ELEMENTARY CLASSES

WILLIAM W. LYNCH, CAROLE AMES

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A Comparison of Teachers' Cognitive Demands in Special EMR and Regular Elementary Classes

William W. Lynch, Carole Ames
Center for Innovation in Teaching the Handicapped
Indiana University

This study compares the cognitively oriented teacher-pupil interactions observed in a sample of ten intermediate special EMR classes with those observed in ten regular third-grade classes in the same schools. Differences between samples in the rate of interaction, cognitive level, and distribution of opportunities among individual pupils are examined. In addition, the relationship of the teacher's cognitive demands on individuals to the teacher's evaluative judgment of those pupils is examined in each group.

The principal instrument used in the study is the Individual Cognitive Demand Schedule (ICDS).[1] It is an observation instrument on which observers code each instructional interchange between the teacher and an individual pupil. The ICDS yields a record of the frequency and cognitive level of all of a teacher's verbal interactions with pupils that occur during instruction. It also codes the cognitive level of pupil responses and the teacher's feedback to those responses.

The investigation began in September 1969 as a descriptive field study of how teachers of special classes for the educable mentally retarded individualize instruction. The general aim was to obtain a detailed baseline description of the kinds of information that special-class teachers have about their pupils and how they

adapt instruction to each individual. We were interested in determining whether there was a relationship between the salient information a teacher has about a child and the way that child is taught. Such data were sought as the first step for a planned series of intervention experiments in in-service teacher education activities later in the year.

Originally there had been no intention of conducting a comparative study. But the outcomes of the first year's study led to the decision to compare the special-class findings with data from a sample of regular classes. It took an entire school year to obtain reliable data on the individualizing styles of our sample of special-class teachers. By the end of that year we had found stylistic variations among special-class teachers in their verbal cognitive demands that suggested that many such teachers interact with individuals relatively infrequently, that their cognitive level of interaction was typically quite low, and that some teachers showed a marked tendency to "play favorites" among their pupils (Lynch & Ames, 1971a). We also found very little evidence of systematic relationships between how teachers perceived their pupils and their interactions with them (Lynch & Ames, 1971c). In the case of teachers who "played favorites," we were unable to discover the reasons for this in the perceptions teachers had of their pupils. All of these findings suggested an investigation of a sample of regular elementary classes to determine if those teachers were any different. Hence in the following year, 1970-71, we gathered some comparative data from a sample of third-grade classes, using somewhat modified procedures.

Should teachers of regular elementary classes be expected to manifest different styles of instructional interaction from those which we found with special-class teachers? Common sense suggests several reasons for expecting differences. In the first place, instructional dialogue with normal children should be at a higher cognitive level than that found with classes composed entirely of so-called "retarded children." Furthermore, both because of their more advanced intellectual development and because of a history of greater success in school, regular-class children might be expected to be more responsive to varied teacher cognitive demands. This in turn might cause regular-class teachers to become more versatile in their cognitive demands. Another difference that might be expected would be a smaller number of opportunities that each regular-class child would have to be personally involved in instructional dialogue with the teacher, simply because of the larger number of pupils to whom the teacher must attend. The larger class also might make it easier for the teachers to "play favorites" with a small proportion of the pupils who, for one reason or another, are most salient, or intrusive upon the teacher.

There is also reason to believe that regular elementary teachers may be more influenced by their evaluations of individual pupils in their instructional interactions. It seems likely that in the larger, more heterogeneous regular class, certain pupils may stand out for the teacher, either as having high ability or as having problems. This greater salience of some pupils could lead to the "expectancy" or "Pygmalion" effect, with the more able pupils being given both more challenging opportunities and greater reward, and the less able being

treated in ways that betray the teacher's expectancy. The findings of Brophy and Good (1970), among others, lead us to expect this effect in regular classes.

The Samples

Ten special classes for EMR children, ages 9-13, and ten third-grade classes in the same schools were selected for the study. These classes were in eight elementary schools in a large midwestern city (population 700,000). The schools were mainly in inner-city areas serving lower to lower-middle class neighborhoods. The teachers in both types of classes had had at least one year of experience.

The special classes originally consisted of 13 intermediate special EMR classes picked by the Director of Special Education of the school system as a sample representative of the school districts of the city from the point of view of socioeconomic class and ethnic composition. Each class typically consisted of 12-16 pupils in the 9-13 age range. They had been placed in special classes as a result of teacher referral, assessment by a school psychologist that yielded a WISC or Binet IQ below 80, and other supporting data. Most pupils had been in a special class for more than one year. No classes were selected that were taught by beginning teachers or in which there was a student teacher.

Three of the original 13 classes were dropped during the first year because there was so little formal instruction going on that it became wasteful of an observer's time to go to code with the ICDS in those classes. In addition, two of these teachers had severe behavior management problems that were aggravated by the presence of an observer.

The surviving ten classes are still representative of the special classes in this city in that the teachers have comparable training and experience. Obviously, however, the ten classes may not be completely representative in teaching behavior.

In selecting the third-grade classes from the same schools beginning teachers were again eliminated, as were those classes that had student teachers. Where there was a choice of third grades, a random selection was made.

Data Gathering Procedures

Observational data in the special classes had been collected by two observers throughout the entire 1969-70 school year, sampling instruction in all academic subjects. The 1970-71 data were collected by three different observers, gathering data during the period of February through May. During the second year the data were limited to instruction in only those times when reading and language arts (writing, spelling, literature, etc.) were taught, and the comparison data from the special classes are limited only to those gathered in the same subjects. The decision to limit the comparison to these subjects was made primarily to ensure reliable data for the shorter observation period we had available the second year and because these areas are the most comparable in terms of content and method. Reading and language arts were also the areas in which the lowest cognitive levels were found in the special classes. Because of the critical importance of these areas in the educational development of the retarded (whether in special class or regular class) it seemed more important to focus on instruction in these areas.

After an initial period during which pairs of observers gathered data in the same classes until adequate reliabilities were obtained, each observer was assigned to observe a group of classes. Every attempt was made to visit a class at times when instruction was scheduled to take place. However, the fact that some teachers did not always follow their announced schedules and the fact that there were many occasions when no instruction at all took place when the observer was present meant that widely different amounts of observation time were needed to obtain even roughly comparable total ICDS frequencies from each class. This problem was compounded by the fact that teachers differed widely in the rates at which they interacted with individual pupils. Consequently, a short period of observation in one classroom could yield a greater number of teacher-pupil interchanges than a much longer period of time in another classroom with a less active teacher. The results of these variations in instructional behavior were very uneven amounts of data per teacher. Table 1 summarizes the data on amount of instructional time in reading and language arts observed, the number of pupils per class, the number of interchanges coded, and the resulting rates of interchanges per hour.

Teacher judgments of pupil ability were gathered in different ways in the two groups of classes. The third-grade teachers were simply asked to designate those pupils in the class who were in the top and bottom third of the class in general achievement.[2]

In the special classes teacher judgments were obtained in a variety of ways--two formal questionnaires, an in-depth interview,

Table 1

Interaction Rates for Reading and Language Arts

Teacher Number	Total Observation Time	Total Number of Interactions	Rate of Interactions Per Hour
EMR Classes			
1	7 hrs. 35 mins.	625	82
2	7 hrs. 40 mins.	224	29
3	8 hrs. 30 mins.	480	56
4	0 hrs. 40 mins.	63	94
5	6 hrs. 30 mins.	363	56
6	3 hrs. 50 mins.	118	31
7	5 hrs. 15 mins.	159	30
8	6 hrs. 02 mins.	304	50
9	3 hrs. 25 mins.	184	54
10	5 hrs. 20 mins.	235	44
Third Grade			
1	15 hrs. 00 mins.	644	43
2	9 hrs. 40 mins.	1118	116
3	8 hrs. 30 mins.	504	59
4	5 hrs. 35 mins.	613	110
5	5 hrs. 20 mins.	559	105
6	8 hrs. 05 mins.	494	61
7	10 hrs. 40 mins.	636	60
8	7 hrs. 25 mins.	224	30
9	5 hrs. 35 mins.	564	101
10	9 hrs. 25 mins.	415	44

and many informal conversations throughout the school year that were recorded as a part of general, daily anecdotal records kept on these classes. For purposes of the comparative study reported here, we use the judgments from the in-depth interview in which the teacher was encouraged to talk at length about each child in the class. The tape recording of that interview was content-analyzed for trait types and evaluative bias. The top, middle and bottom thirds of the class as determined by the percent of favorable attributions by each teacher were used for the comparison.

Dependent Measures

Several indices from the year's study of special-class teachers yielded wide variations in their instructional styles. These same indices were derived for the third-grade teachers and the two groups were compared. The indices are: rate of interchanges per hour; cognitive demand level; percent of pupils receiving 75% of the higher level interchanges; percent of pupils receiving 75% of all interchanges; and the percent of feedback that was categorized as "informative." Rate is the total number of interchanges per hour, based on all ICDS data collected on each teacher. It is a measure of the relative frequency with which the teacher interacts instructionally with individual pupils. Cognitive demand level is the percentage of interchanges falling in the upper level categories of the ICDS ("explaining," "defining-applying," "inferring," "imagining," "evaluating," and "problem solving"). These upper level categories all represent cognitive demands that require the child to transform and elaborate on information, whereas the lower level categories simply require identification and memory responses.

The next two indices were derived to reflect the extent to which a teacher favored certain children during instruction. One index is a measure of the extent to which higher level cognitive demands were concentrated among a small number of pupils. It designates the percentage of pupils in the class who account for 75% of the higher level interchanges. The second index simply measures the extent to which a teacher favored certain individuals in general instructional interaction, without respect to level. It designates the percentage of pupils receiving 75% of all interchanges. Thus, for example, the teacher who showed the greatest "favoritism" allocated 75% of her interchanges to only 26% of her pupils (thus the index for that teacher would be 26). In contrast, the two teachers with the most even distribution of interchanges both allocated 75% of the interchanges to 68% of their pupils.

A final index of teacher style was the proportion of the teacher's feedback that had been coded as informative feedback. The ICDS records four basic types of teacher response or feedback to a child's response in an instructional interchange--positive, negative, informative, and no feedback. Positive feedback consists of a simple communication of correctness or approval by the teacher ("right," "O.K.," "good," etc.). It is the most frequently used type of feedback. Negative feedback is a communication to the child that his response is unacceptable. (This type of feedback is very infrequent.) Informative feedback consists of either elaborating on a child's response or following up on the response with some type of probing question or request, either to the child himself or to another child. The first year's study of special-class teachers showed considerable variation among teachers in the

extent to which they used informative feedback. For this reason, and because there is some basis for thinking that informative feedback is the most effective form in promoting learning, this index is used in our comparison of special and regular classes.

Results

Cognitive Demand Styles

The comparisons of the third-grade and special classes on the five teaching style indices were made by a series of one-way analyses of variance. Data were transformed to arcsin functions for two indices, the percentage of pupils receiving 75% of the interchanges and the percentage of informative feedback, because the F-max test had indicated non-homogeneity of variance. Table 2 presents the means and standard deviations for the five indices of cognitive demand styles. The analyses of variance for these indices (Table 3) reveal no significant differences between the groups on any index. One index, rate of interchange, approaches significance at the .05 level (significant at the .10 level). There is a tendency for the special-class teachers to manifest lower rates, but the variance within each group of teachers is extremely large.[3]

Thus, there is no clear evidence for a difference between special and regular classes in the rate, cognitive level, informative feedback, or distribution of interchanges per pupil. The large variability within each group on most indices should be noted in considering any generalizations about teachers of either type of class.

Table 2

Means and Standard Deviations for Five ICDS Indices

ICDS Index	Special Classes (1970 Sample)		Third Grade Classes (1971 Sample)	
	$\bar{X}$	SD	$\bar{X}$	SD
Rate of Interchange/hr	46.0	20.54	72.9	30.21
Percent of Higher Level Interchanges	22.3	8.97	23.0	8.60
Percent of Pupils Accounting for 75% ICDS 5-11	50.4	8.09	44.2	9.36
Percent of Pupils Accounting for 75% Total Interchanges	56.6	5.44	55.9	11.82
Percent of Informative FB	14.9	8.37	13.0	3.71

Table 3

Analysis of Variance Summary for ICDS Indices in Special and Third-Grade Classes

Source	df	Rate of Interchange*		Percent of Higher Level Interchanges		Percent Pupils 75% ICDS 5-11		Percent Pupils 75% Total Interchanges		Percent of Informative FB	
		MS	F	MS	F	MS	F	MS	F	MS	F
Between Classes	1	2936.89	4.36	1.25	.01	192.20	2.26	2.45	.03	18.05	.39
Within (error)	18	672.88		86.32		85.00		94.07		46.61	
Total	19										

*Based on the total of 19 teachers, reducing the error df to 17[4].

Relationship of Individual Cognitive Demands to Teachers' Levels of Individual Evaluation

To determine whether the third-grade teachers favored in their frequency of interchanges those pupils whom they judged to be more able, a separate 3(levels of pupil achievement) x 10(teachers) analysis of variance was computed for each of the four ICDS indices--rate of interchanges, percentage of higher level interchanges, percentage of informative feedback, and percentage of positive feedback. The special-class data were also analyzed by a 3 x 10 analysis of variance. In the special classes the three levels of achievement were determined by the percentages of favorable attributions on each child appearing in the content analysis of teacher interviews.

Table 4 shows the means and standard deviations of four indices of teacher cognitive demand styles in the special classes. Table 5 gives the analyses of variance summary for these indices by teachers.[4] The only significant F value was obtained on teacher differences in percentage of reading interchanges (which does not bear upon the question). There is no evidence of any tendency for special-class teachers to favor pupils of any level of evaluation.

The data from the third-grade classes, on the other hand, give a very different picture. The means and standard deviations for four ICDS indices are presented in Table 6.[5] As indicated in Table 7, there is a statistically significant tendency ($p < .01$) for the third-grade teachers to vary the number of interchanges, number of higher level interchanges and amount of positive feedback across levels of achievement. These differential teacher treatments of pupils at different perceived levels of achievement are shown in Figure 1. In each case

Table 4

Means and Standard Deviations of ICDS Indices for Three Levels of Evaluation--EMR Classes

ICDS Index	Perceived Level of Evaluation					
	Low		Medium		High	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Percent of Interchanges	6.68	3.92	7.05	3.83	7.34	3.16
Percent of Reading Interchanges	6.17	5.60	6.05	4.65	6.42	5.18
Percent of Higher Level Interchanges	6.44	5.10	7.19	5.20	6.58	3.76

Table 5

Analysis of Variance for Teacher x Levels of Evaluation--EMR Classes*

Source	df	Percent of Interchanges		Percent of Higher Level Interchanges		Percent of Reading Interchanges	
		MS	F	MS	F	MS	F
Teachers (A)	9	.013	.55	.018	.39	.246	5.90**
Achievement Level (B)	2	.004	.16	.007	.15	.004	.09
Teachers x Achievement Level (A x B)	18	.028	1.20	.048	1.07	.059	1.42
Students Within Teachers x Achievement Level S (A x B)	91	.023		.048		.042	

*All dependent measures were transformed to Arcsin functions for the ANOVA.

**$p < .01$

Table 6

Mean Frequencies on ICDS Indices Per Child for

Three Levels of Achievement--Third Grade

ICDS Index	Levels of Achievement		
	Low	Medium	High
No. of Interchanges/child	16.2	23.9	36.4
No. Higher Level Interchanges/child	3.7	5.9	9.9
No. Positive FB/child	7.5	11.1	15.2
No. Informative FB/child	2.8	3.5	4.6

Table 7

Analysis of Variance for Teachers x Levels of Achievement--Third Grade[a]

Source	df	No. of Interchanges		No. of Higher Level Interchanges		No. of Informative FB		No. of Positive FB	
		MS	F	MS	F	MS	F	MS	F
Teachers (A)	9	.0110	.80	.0151	.46	.0465	1.10	.0097	.40
Achievement Level (B)	2	.3343	24.22**	.5202	15.96**	.0689	1.63	.3888	16.00**
Teachers x Achievement Level (A x B)	18	.0767	5.56**	.0893	2.74**	.1746	4.14**	.0757	3.12**
Students Within Teachers x Achievement Level S(A x B)	150	.0138		.0326		.0422		.0243	

**$p < .01$

[a]Based on arcsin transformed data.

the pupils at the high level achievement are favored. Significant teacher x perceived achievement level interactions were also obtained, suggesting that the tendency to favor high level pupils cannot be generalized across all teachers. Tukey post-hoc tests showed that significantly ($p < .01$) more of the teachers' interchanges, higher level interchanges, and positive feedback were directed to students perceived as high achievers than were directed to students perceived as low achievers. Similarly, Tukey tests showed that the high achievement level group received significantly more interchanges than the low level group.

Discussion

The finding of no significant differences between the special classes and the third-grade classes on any cognitive demand indices may seem surprising in the light of the "common sense" speculations expressed earlier (pp. 3-4). However, it should be pointed out that the curriculum and teacher objectives in the reading and language arts classes in which the data were gathered were probably very similar. Add to this the fact that the mean mental age level of the special-class pupils (approximately M. A. 8 years) was not very different from that of the third-grade pupils, then it could be that both groups of teachers may have been following very similar instructional tactics.

On the other hand, comparisons between the groups are difficult to make because of the enormous variation between teachers in each group. While there seems to be a lack of distinctiveness for either group in teaching style, one is struck by the extensive inter-teacher differences even on such basic matters as amount of instructional time

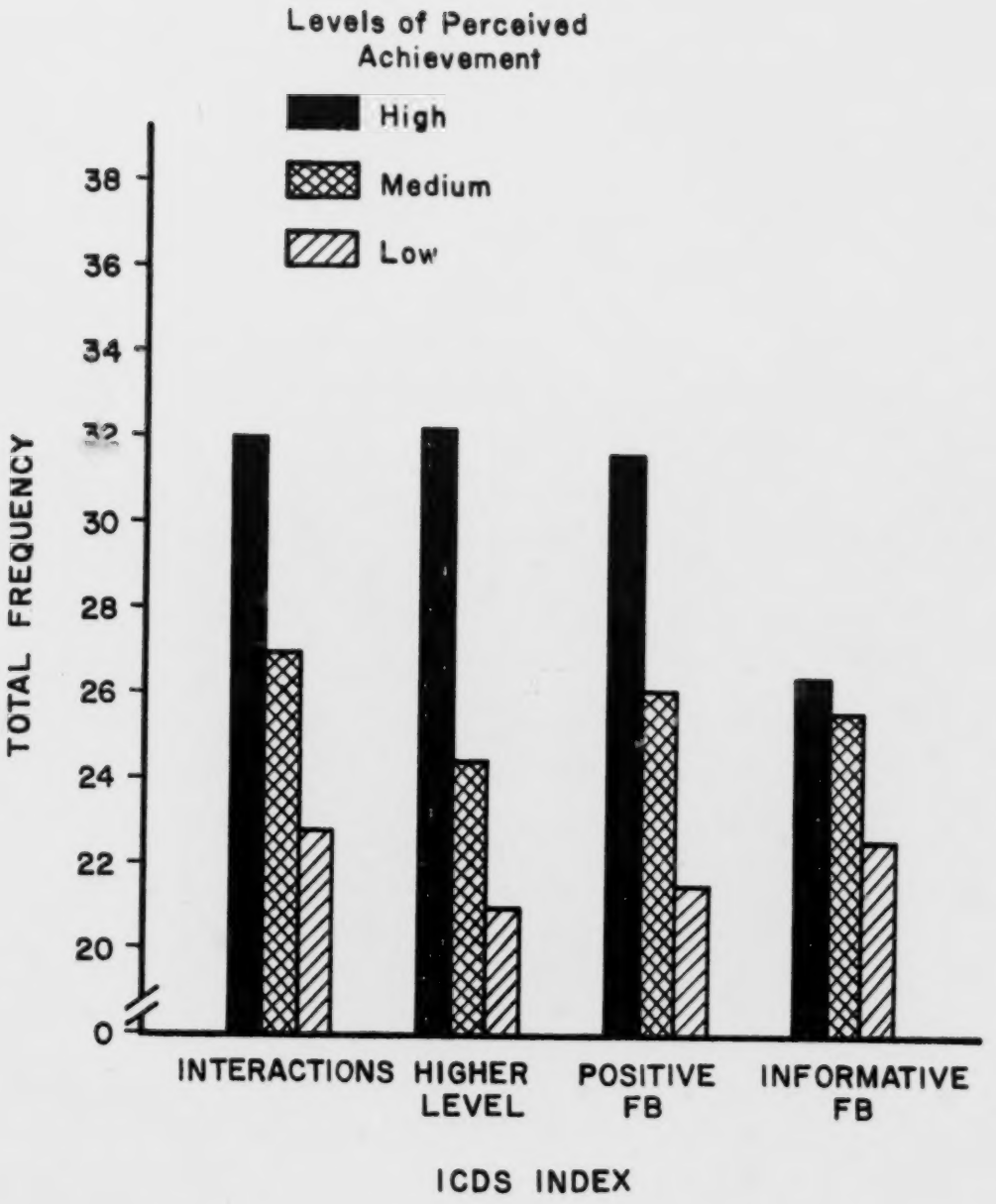

Fig. 1. ICDS Indices by Levels of Perceived Pupil Achievement.

devoted to reading (see Table 1), to say nothing of the stylistic features revealed in the ICDS indices. It is difficult to explain such idiosyncratic patterns.

Another "common sense" notion should be examined. There should be more opportunities for personal interaction between teacher and pupil in the smaller classes (e.g., special classes). This can be examined by considering what might be called an "opportunity index" computed by dividing the teacher's rate of interchanges per hour by the number of pupils in the class. When the mean rate for special class teachers is 46.0, divided by the average class size (15), we have an "opportunity index" of approximately three teacher interchanges per child per hour. Double the class size at this rate and the index drops to 1.5 interchanges per child per hour. But notice that the mean rate for the third-grade classes was 72.9, yielding an "opportunity index" of about three, the same as for the special classes. So, on the average, children in regular classes are receiving as many opportunities despite the larger class size by virtue of the fact that teachers' rates of interaction in these classes are typically higher. (It should also be noted that the large variance in both samples indicates that a sizable number of teachers in each group are atypical of the central tendency.)

While no differences appear between types of classes in overall cognitive demand styles, a difference is found in the tendency to differentiate between pupils by level of achievement, with the third-grade teachers showing a marked tendency to favor those pupils whom they judged to be their better pupils. Considering the fact that the

so-called "mentally retarded" child is most likely to be in the lowest group in the eyes of the regular-class teacher, in view of the smaller class size in the special class, and considering the fact that special-class teachers use pretty much the same cognitive demand styles as regular-class teachers, one might be tempted to conclude that retarded children are better off in special classes. Such generalizations are unwarranted, simply because (a) we have no evidence here that personalized instructional interactions or any particular types of cognitive demands or feedback lead to more learning and (b) the studies of the efficacy of special classes suggest a contrary conclusion--namely that EMR children may typically be better off in regular classes as far as cognitive development and learning are concerned.

We are not tempted to draw any practical conclusions from this study. Our findings suggest that, as far as the features of instruction recorded on the ICDS are concerned, there is ". . . nothing special about special education," other than the fact that special-class teachers do not seem to favor the more able pupils, while the regular-class teachers showed a definite bias toward more able children.

The research conducted subsequent to this study has concentrated on determining what difference cognitive demands make upon pupil performance and learning. Hopefully this will produce better guidelines for helping teachers to follow more adaptive, rational patterns of instructional behavior than are suggested in the two years of observational work from which the data reported here were drawn.

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Lynch, W. W., & Ames, C. Individual cognitive demand schedule. Technical Report 4.2, Bloomington, Indiana: Center for Innovation in Teaching the Handicapped, 1971. (b)

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Footnotes

[1]William W. Lynch & Carole Ames, Individual Cognitive Demand Schedule, Technical Report 4.2 (Bloomington, Indiana: Center for Innovation in Teaching the Handicapped, 1971).

[2]These judgments were obtained in connection with another, related study by Leo A. Robinson. The authors wish to express their gratitude to him for these data.

[3]One of the ten special classes was omitted in this analysis because of an insufficient sample of reading and language-arts instruction. When that teacher's rate is included the mean rate for the special classes goes down to 41.5 per hour (S.D. 14.6).

[4]The comparison of ICDS indices by levels of evaluation was done using percentages rather than raw frequencies because slightly different numbers of pupils fell in the upper, middle, and lower thirds in each class. In the case of the third-grade data, raw frequencies of interchanges could be used because we selected equal numbers of pupils (6) randomly from each third of the class.

[5]Same as footnote #4.